Position of the American Dietetic Association: Integration of medical nutrition therapy and pharmacotherapy

ABSTRACT

It is the position of the American Dietetic Association that the application of medical nutrition therapy (MNT) and lifestyle counseling as a part of the Nutrition Care Process is an integral component of the medical treatment for management of specific disease states and conditions and should be the initial step in the management of these situations. If optimal control cannot be achieved with MNT alone and concurrent pharmacotherapy is required, then The Association promotes a team approach to care for clients receiving concurrent MNT and pharmacotherapy and encourages active collaboration among dietetics professionals and other members of the health care team. There are a number of medical conditions, many of them chronic, that will respond to MNT and, therefore, MNT should be the first intervention for these conditions. In addition to being a vital element of the optimal management and control of these conditions, MNT is also a cost-effective method of management. However, because of the long-term nature of these conditions, concurrent pharmacotherapy may become necessary to achieve or maintain optimal control. In cases where this is necessary, MNT should continue to be an integral component of the therapy because it may complement or enhance the therapeutic effectiveness of pharmacotherapy, thereby reducing or eliminating the need for multiple medications. The utilization of a coordinated multidisciplinary team approach is critical to the success of the concurrent use of MNT and pharmacotherapy because of the long-term duration of the treatments, the necessity of monitoring compliance and effectiveness, and the likelihood of multiple medication-nutrient interactions.

POSITION STATEMENT

It is the position of the American Dietetic Association that the application of medical nutrition therapy (MNT) and lifestyle counseling as a part of the Nutrition Care Process is an integral component of the medical treatment for management of specific disease states and conditions and should be the initial step in the management of these situations. If optimal control cannot be achieved with MNT alone and concurrent pharmacotherapy is required, then the Association promotes a team approach to care for clients receiving concurrent MNT and pharmacotherapy and encourages active collaboration among dietetics professionals and other members of the health care team.

Through the nutrition care process, medical nutrition therapy (MNT) is a specific nutrition service and procedure used to treat an illness, injury, or condition. MNT involves an in-depth nutrition assessment of the patient or client; nutrition diagnosis; nutrition intervention, which includes diet therapy, counseling, or use of specialized nutrition supplements; and nutrition monitoring and evaluation. Lifestyle counseling, as a part of the dietetics professional's application of the Nutrition Care Process, enhances MNT by providing insight into the behaviors and/or events that are associated with appropriate as well as inappropriate eating and exercise behaviors. MNT and lifestyle counseling are cost-effective means of treating a number of diseases and their symptoms. However, because of the long duration and complexity of some diseases, pharmacotherapy is usually also necessary to achieve and maintain optimal disease control. Even after the initiation of pharmacotherapy, MNT should be continued because concurrent use with pharmacotherapy may decrease the amount and/or number of medications necessary to achieve optimal disease control.

Additionally, concurrent administration of MNT and pharmacotherapy requires a thorough, individualized medication-nutrient interaction assessment to identify the potential interactions that may occur. This assessment should also include a review of any complementary and alternative medicine (CAM) therapies being utilized to evaluate potential interactions with both the MNT and pharmacotherapy regimens. Consequently,
a comprehensive evaluation requires a coordinated, multidisciplinary team effort.

ROLE OF THE HEALTH CARE TEAM

By definition, “a collaborative team approach” represents a multidisciplinary group of health care professionals with varied expertise, working together as a team to aid in the care of the patient (6). Multidisciplinary teams including a dietetics professional were formed in the late 1970s in the management of specialized nutrition support. Subsequently, this multidisciplinary team approach has progressed from the critical care setting to the care of patients with hyperlipidemia, diabetes, and obesity in outpatient clinics and other private practice settings. In obesity, the multidisciplinary teams have been expanded to include clinical psychologists, exercise specialists, and other allied health professionals. Benefits of such teams have included improved patient safety and clinical outcomes and cost savings (7).

Rising health care costs are driving the development of more comprehensive disease management strategies that address chronic disease (8). The Disease Management Association of America defines disease management as a system of coordinated health care interventions and communications for populations with conditions in which patients’ self-care efforts are significant. It is an organizational model of a holistic approach in which health care professionals work together in a coordinated and cooperative manner to affect an optimal outcome for a particular patient with a particular disease.

Disease management is directed at conditions such as diabetes, renal disease, hypertension, cardiovascular disease, cancer, and obesity. For each condition, diet can be a contributor as well a therapeutic intervention. This suggests that, for conditions responsive to MNT, dietetics professionals should be involved along the entire continuum of care, from program development through implementation. Hence, disease management offers an opportunity for dietetics professionals. Multidisciplinary disease management programs aimed at chronic multisystem diseases are anticipated to be better accepted by both patients and providers when all relevant professionals are involved in the development of the program (9).

The Diabetes Prevention Program (DPP) demonstrated that lifestyle interventions can prevent or delay the onset of diabetes (10). In addition to functioning as DPP lifestyle coaches, registered dietitians assumed roles as case managers and program coordinators, which represent major role expansions for dietetics professionals working in and with multidisciplinary teams. These role transformations, from clinicians to program coordinators and case managers, have implications for the visibility of dietetics professionals in various practice settings (10).

In addition, the growth of managed care has presented dietetics professionals with new opportunities for reimbursement (11,12). The publication of MNT Current Procedural Terminology (CPT) codes and definitions approved by the American Medical Association and the implementation of Medicare Part B reimbursement for diabetes and nondialysis kidney disease are also likely to result in expanded coverage of MNT by commercial payers. The American Dietetic Association sought CPT codes so that registered dietitians could be paid directly for their services. The MNT CPT codes became available for use among private sector insurers in November 2000 and are also required for implementation of the Medicare Part B MNT benefit (3). According to Fitzner and colleagues, data collected in the 1999 and 2002 environmental scans commissioned by the American Dietetic Association show that few codes were used by health plans in 1999 to report services performed by registered dietitians (13). However, the three new CPT codes for MNT provided by a registered dietitian were in use by most health plans participating in the 2002 scan.

These advances in reimbursement remove barriers and are advantageous to dietetics professionals in private practice and those working in physician-managed clinics. Patients are more likely to comply with a physician referral to a dietetics professional if nutrition services are covered by insurance plans.

USING MNT AND PHARMACOTHERAPY

MNT and lifestyle counseling, as applied through the Nutrition Care Process, are effective treatments for many chronic medical conditions. Several expert committees or panels recommend MNT and lifestyle changes as the initial intervention for certain chronic conditions (eg, hyperlipidemia, hypertension, diabetes) (5,14-16). However, because of the long-term nature of some of these conditions, pharmacotherapy may also be necessary to achieve optimal disease control. Risk stratification, determination of the degree of risk for adverse events related to a medical condition, is often employed to establish the intensity necessary for the initial intervention. For example, MNT alone is recommended as the initial interventions for hyperlipidemia if the low-density lipoprotein cholesterol (LDL-C) concentrations are between 100 and 130 mg/dL and the patient has coronary heart disease (CHD) or CHD risk equivalents (16). However, if the LDL-C is above 130 mg/dL and the patient has CHD or CHD risk equivalents, pharmacotherapy should be initiated concurrent with MNT (16). Risk stratification is also promoted for conditions such as hypertension, type 2 diabetes, osteoporosis, and obesity. If the response to MNT and lifestyle changes alone is not adequate to achieve the desired level of disease control, pharmacotherapy can be initiated, increasing in intensity (ie, increasing the amount of medication prescribed or number of medications prescribed) until optimal disease control is attained. However, increasing the dose and/or number of medications utilized increases the potential for medication-related adverse effects or medication-nutrient interactions. Therefore, ongoing MNT and lifestyle changes are critical to the management of chronic diseases.

POTENTIAL ADVERSE EFFECTS RELATED TO PHARMACOTHERAPY

Adverse effects associated with pharmacotherapy are a common reason for nonadherence with prescription medications (17). For example, drug-induced weight gain has recently been recognized as a serious medical problem, compromising the effectiveness of drug therapies (18-23). Drugs used to treat diabetes and psychiatric, neurologic, and other disorders can cause weight gain. Conversely, other drugs used to treat these disorders are either weight “neutral” or cause weight loss. Studies show that clozapine, a treatment for schizophrenia, and other antipsychotics significantly increase weight, hypertension, dyslipidemia, and risk for diabetes (18,19). Therefore, MNT and lifestyle counseling should be a component in the treatment of patients who take those drugs known to cause weight gain.

In addition to adverse effects, other reasons for noncompliance with prescribed medications include socioeconomic status, personality, culture, values, mental capacity, understanding of the disease, social support systems, and financial factors.
Socioeconomic status has been demonstrated to affect patients' ability to self-manage their disease, a particularly important parameter in the control and treatment of diabetes mellitus, and to result in poor food choices, potentially compromising pharmacotherapy and increasing the risk of food-drug interactions (25,26). Education has been shown to improve compliance with therapeutic interventions, reducing the likelihood of adverse effects (27,28).

Failure to take medications correctly has been estimated to cost the United States economy $100 billion per year (24). An estimated 40% of patients are expected to experience a therapeutic failure caused by medication-related problems or the development of new medical conditions resulting from the pharmacotherapy. Because drug compliance rates are estimated to be between 50% and 60%, the potential ability of a pharmaceutical intervention to treat a disease is frequently unknown. Dietetics professionals have the expertise to provide the nutrition intervention required to reduce the risk of adverse reactions associated with poor food choices.

**USE OF COMPLEMENTARY THERAPIES WITH MNT AND PHARMACOTHERAPY**

The use of CAM therapies in the United States is steadily increasing, with, depending on how broadly or narrowly CAM is defined, an estimated 6.5% to 43% of the US population using some form of CAM (29-31). CAM can include chiropractic, acupuncture, massage, herbs, and mind-body therapies as well as the use of over-the-counter (OTC) nutritional and dietary supplements (30). The widespread use of herbs and OTC supplements is of concern because of the potential impact on the efficacy of MNT and pharmacotherapy.

According to the American Dietetic Association MNT evidence-based guides for practice, dietetics professionals should review use of herbs or nutritional supplements as part of the in-depth nutrition assessment because of their prevalence of use and the number of potential interactions that may occur (32-35). Evaluation of these potential interactions should be based on current scientific evidence, which can be a challenge given the rate at which new research is being conducted in this area. However, numerous scientifically based resources are available (eg, The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines [36]; Herbal Medicine: Expanded Commission E Monographs [37]; Herb Contraindications and Drug Interactions [38]; The Health Professional's Guide to Popular Dietary Supplements [31]; Physician's Desk Reference for Herbal Medicines [39]; Physician's Desk Reference for Nonprescription Drugs and Dietary Supplements [40]; and Physician's Desk Reference for Nutritional Supplements [41]).

The interactions between CAM therapies and MNT or pharmacotherapy can be either positive or negative. Herbs and nutritional or dietary supplements may increase or decrease the bioavailability of medications or other nutrients (eg, psyllium can delay the intestinal absorption of medications, minerals, or vitamins taken at the same time [36]) or have antagonistic effects (eg, kava extract may reduce the efficacy of levodopa in the treatment of Parkinson's disease [42]). Additionally, these same products may have additive effects (eg, kava extract and diazepam taken together at normal doses can result in lethargy and disorientation [42]) or enhance the action of medications (eg, consumption of bromelain may increase the anticoagulant effects of anticoagulant medications [42]) by mechanisms other than affects on bioavailability. Some products may also offer protection from the adverse effects associated with certain medications (eg, milk thistle seed extract may protect the liver from the hepatotoxic effects of certain psychotropic medications [42]). Even common components of the typical American diet may enhance or interfere with certain medications (eg, grapefruit inhibits the oxidative metabolism of some lipid-lowering medications by the intestinal cytochrome P450 3A4 isoenzymes, increasing their bioavailability [43]; high-dose garlic or fish oil supplementation can prolong bleeding time and enhance the action of anticoagulants such as warfarin sodium [51]). Consequently, health professionals need to have the knowledge and resources available to evaluate the full range of potential affects associated with this rapidly growing area.

**CHRONIC DISEASE AND MNT**

The United States Census Bureau reports that, in the year 2000, 12.6% of the United States population (approximately 34,720,000 people) were 65 years of age or older and 3.3% (approximately 9,093,000 people) were 80 years of age or older (44). These percentages are projected to increase to 20% (approximately 70,265,000 people) and 5.3% (approximately 18,620,000 people) of the total US population, respectively, by the year 2030 (44). A consequence of the aging of the population is an increase in the incidence of chronic diseases such as diabetes mellitus, obesity, hypertension, osteoporosis, cardiovascular disease, and cerebrovascular disease. Because the onset is subtle, chronic diseases tend to be characterized by symptoms and complications of long duration. As a result, patients with one or more chronic diseases require long-term management, typically under the care of a primary care physician and a health care team. Although pharmacotherapy is usually a part of the therapeutic regimen, the chronic diseases or their symptoms can be managed with nutrition intervention as well; therefore, MNT is an integral part of the recommended treatment protocol.

Other chronic conditions, such as inflammatory bowel syndrome and other conditions that affect the gastrointestinal tract, Parkinson's disease, and seizure disorders that respond to a ketogenic diet, or symptoms associated with these conditions also respond to nutrition intervention. However, pharmacotherapy in addition to nutrition intervention is usually required for optimal control of the condition and associated symptoms. Patients with more complex chronic conditions that involve organ system dysfunction, such as chronic obstruction pulmonary disease, congestive heart failure, renal disease, liver disease, cancer, and immune system diseases, including Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome, will require pharmacologic intervention, although concurrent MNT is essential to optimize the effectiveness of the therapeutic regimen.

The concurrent use of MNT and pharmacotherapy to treat chronic conditions is, by necessity, of long duration. Consequently, monitoring patients to ensure adherence to the prescribed therapy and verify its effectiveness is a continuous process that is most efficiently performed by a health care team. Patients should be encouraged to continue their MNT regimen, including recommended lifestyle changes such as food choice changes and changes in exercise, even when pharmacotherapy is necessary to achieve desired disease control. The continued inclusion of MNT as part of the multidisciplinary treatment plan can result in effective disease control with less intense pharmacotherapy (eg, lower doses of medications or monotherapy instead of polytherapy) (5). As a result, the cost of the therapy...
will be lower, and the incidence of side effects will be reduced. These factors may, in turn, improve adherence with the overall therapeutic regimen because two of the most common reasons for not taking medications as prescribed are the cost of and the adverse effects associated with the medication (17).

**DIABETES MELLITUS AND COMPLICATIONS**

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels (45). The most common forms of diabetes are type 1 and type 2, type 1 being dependent upon exogenous insulin.

Type 2 diabetes has reached epidemic proportion (46,47) and is expected to increase by 165% from 2000 to 2050 (48). The annual cost of diabetes in medical expenditures and lost productivity reflects these demographics, climbing from $98 billion in 1997 to $132 billion in 2002 (49). Individuals over 45 years of age and who have a BMI ≥ 25 kg/m², growing segments of the population, are at increased risk of developing type 2 diabetes mellitus (45). An estimated 80% of patients with type 2 diabetes mellitus are overweight or obese (50,51). The alarming emergence of childhood and adolescent type 2 diabetes is correlated with the increasing incidence of severe obesity in this age group (52,53). Prevention of excess weight gain and obesity is critical to reverse these trends.

MNT is an important component in the prevention, delay, and treatment of type 1 and type 2 diabetes (14,15,48,54-56). Behavior changes, including diet and exercise, will prevent and delay the development of type 2 diabetes, with the primary objective being a reduction in body weight (14,57-59). MNT for people with diabetes should be individualized, with consideration given to each individual’s usual eating habits, metabolic profile, treatment goals, and desired outcomes (55). Monitoring of metabolic parameters, including glucose, HbA1c, lipids, blood pressure, body weight, and renal function, when appropriate, as well as quality of life is essential to assess the need for changes in therapy and to ensure successful outcomes. Ongoing nutrition self-management education and care need to be available for individuals with diabetes. For a complete listing of current evidence-based scientific rankings of MNT guidelines using the recently published American Diabetes Association grading system, refer to Franz and colleagues (54).

When blood glucose levels cannot be adequately controlled by lifestyle interventions, pharmacologic intervention is indicated. Oral hypoglycemic agents such as the sulfonylureas, nateglinides, biguanides, α-glucosidase inhibitors, thiazolidinediones, and combinations of these drugs are used before progressing to exogenous insulin and insulin analogs when pancreatic beta cells become exhausted in the later stages of the disease. The modes of action of these drugs include enhancing insulin sensitivity, inhibition of hepatic glucose production, stimulation of insulin secretion, and inhibition of intestinal glucose absorption. However, several of these agents (insulin, sulfonylureas, and thiazolidinediones) promote weight gain (21,22,60), making weight loss more difficult for overweight and obese patients. Alternative agents that may promote weight loss or be weight neutral include metformin, acarbose, miglitol and the weight loss drugs orlistat and sibutramine. MNT, combined with a thorough understanding of medication-nutrient interactions, as practiced by dietetics professionals, is essential for enhancing the effectiveness of these drugs and for reducing their adverse effects (61-63).

The support of the entire health care team, including the dietetics professional, is instrumental for patient self-care competence. Patients should be capable of knowing how to use glucose data to adjust food intake, exercise, or pharmacologic therapy to achieve their therapeutic goals.

Advances in molecular biology technology and identification of new drug targets are expected to yield novel pharmacologic agents for blood glucose control. Examples of new drugs under investigation are amylin and its synthetic analog pramlintide, glucagon-like peptide-1 (GLP-1), and dipeptidyl peptidase IV inhibitors. These agents moderate postprandial glucose excursions by delaying gastric emptying (64-66). Although these drugs are expected to be more effective and to produce fewer adverse effects, dietetics professionals will continue to need to alert patients about the ongoing importance of lifestyle interventions for optimal glucose control and the possible nutritionally related effects of these drugs.

In addition to diabetes mellitus types 1 and 2, MNT has been demonstrated to be effective for other conditions associated with insulin resistance. One example is polycystic ovary syndrome (PCOS), a common endocrine disorder in women of reproductive age with primary manifestations of infertility, menstrual dysfunction, and clinical or biochemical hyperandrogenism. Obesity is common in PCOS, but not universal, and is present in approximately 10% to 50% of women of reproductive age. Weight loss will reverse the insulin resistance and associated reproductive dysfunction and lessen the risk for developing type 2 diabetes and long-term cardiovascular disease (67,68). Hyperglycemia and insulin resistance are also common in critically ill patients, even when there has been no prior history of diabetes. Recent studies have reported that the use of intensive insulin therapy to maintain blood glucose at a level that does not exceed 110 mg per deciliter can substantially reduce mortality and morbidity in patients admitted to the intensive care unit (69,70). Additional studies are needed to determine whether MNT in conjunction with intensive insulin therapy is beneficial to patient outcomes.

**OBESITY AND COMPLICATIONS**

Obesity has reached epidemic proportions in the United States. It is estimated that 50% to 65% of the US population is either overweight or obese (21,71-75). Environmental factors such as a decrease in physical activity and increased food intake are attributed to this trend (74,76-80). Obesity is associated with high blood pressure, type 2 diabetes, insulin resistance, hyperinsulinemia, dyslipidemia, coronary heart disease, gallbladder disease, some forms of cancer, sleep apnea, and other chronic conditions (21,71).

In 2000, the obesity market generated over $426 million in drug sales in the United States (81). The marked growth in this potential patient population will be a main driver in estimating the obesity market for pharmaceutical sales. Sales are projected to exceed $1.3 billion in 2010.

Antiobesity agents target appetite suppression, increased thermogenesis, and/or reduced nutrient absorption to produce negative energy balance (82-84). Sibutramine and orlistat are the only two antiobesity agents currently approved for long-term use. Sibutramine suppresses appetite and causes an increase in metabolic rate (85,86). Orlistat, a lipase inhibitor, reduces fat digestion and absorption. Fenfluramine-phentermine, an extremely effective agent, was removed from the
market because of serious heart disease. The FDA-approved over-the-counter (OTC) appetite suppressant, phenylpropa
nolamine, was removed from the market in 2000 because of an association of strokes with its use in women.

Dietary supplements, herbal preparations, and other OTC products are also used as antiobesity agents. Convincing data that demonstrate either the efficacy or safety of these products are essentially nonexistent. The National Institute of Health does not recommend them as part of a weight-loss program because of potentially harmful effects and unpredictable levels of the purported active ingredients (82). OTC compounds that may have some effect are 5-HTP/tryptophan, calcium/vitamin D, cimetidine, ephedrine, and teas (87). Those with question-
able no weight loss effect are chitosan, chromium, garcinia cambogia, hypericum, and melatonin.

Drugs approved for disease indications other than obesity, such as depression, epilepsy, and diabetes, are prescribed and are under clinical investigation as antiobesity agents (82-84). Bupropian use is associated with weight loss and is being investigat-
ed in clinical trials as an antiobesity agent. Selective sero-
totonin-reuptake inhibitors (SSRIs) such as sertraline and fluox-
etine have very limited effects on appetite (82,88). The R-fluoxetine drug development program was discontinued after some subjects developed increases in QTc prolongation, a symptom associated with heart arrhythmias. Anticonvulsants such as topiramate reduce food intake and cause weight loss. Some antidiabetes agents such metformin can cause or help to maintain weight loss. Other drugs used for weight loss, but approved for indications other than weight loss, are diazoxide, diethylpropion, naltrexone, phendimetrazine, and phenter-
mine (81,82,89). New drug targets are likely to result in the development of novel antiobesity agents that are more effect-
tive in producing weight loss.

Tens of new agents are in clinical trial, such as cabergoline (a dopamine receptor agonist), cannabinoid antagonists, β-3 ad-
ergenic agonists, ghrelin, cholecystokinin-A agonists, and hu-
an growth hormone peptide analogs (81,82,84). Leptin has failed as an antiobesity agent in human clinical trials. The ob-
ervation that obese individuals already have elevated circulating leptin levels, indicating leptin resistance, supports ongoing research to determine whether agents that modulate leptin receptor response to leptin will produce weight loss.

Increasing physical activity and decreasing energy intake is considered the most effective and lasting method of losing weight and maintaining weight loss (72,83). Many environmen-
tal and behavioral factors such as decreased physical activity, large portion sizes, and foods high in caloric density are counterproductive to this approach (74,76-80). The US government is taking action to identify strategies to change these factors and to reverse the alarming trends in overweight and obesity (73,75).

Dietetics professionals play an integral role, which is multi-
faceted and cannot be understated, in addressing the problem of obesity in the United States. Their knowledge and skills in lifestyle counseling and in managing nutrition-related side ef-
effects associated with prescription and OTC antiobesity agents and bariatric surgery places them in a unique position to edu-
cate the public and other health care practitioners in the pre-
vention and treatment of obesity.

HYPERTENSION
Approximately 43 million people in the US population, or 24%, have hypertension, and, as people age, the incidence of hyper-
tension increases, the result being that less than 20% of people over 70 years of age having a blood pressure in the optimal range (90). For many years, pharmacotherapy was the primary therapeutic regimen employed to lower blood pressure (90), and, for many patients, poor control on a single medication resulted in polypharmacy (91). However, recent research sup-
ports the use of MNT and lifestyle changes as concurrent inter-
ventions with pharmacotherapy in the treatment of hyperten-
sion, and, in some cases, MNT should be the primary inter-
vention (90,92).

The most recent reports from the Joint National Committee (JNC) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommended the reduction of dietary sodium intake, weight loss, and increased physical activity as initial effective methods of reducing blood pressure and proposed them as the first steps in the treatment of hypertension. Pharmacologic therapy would be initiated only if the goal blood pressure level is not obtained with MNT and lifestyle changes alone (5,93). Additionally, the 6th report from the JNC recom-
mands increasing dietary potassium intake and a desirable di-
etary pattern that includes increased vegetable and fruit con-
sumption. These MNT interventions were also supported by the Dietary Approaches to Stop Hypertension (DASH) study (5,92). Metaanalyses of randomized clinical trials have re-
ported systolic and diastolic blood pressure reductions of ap-
proximately 4 and 2 mm Hg in hypertensive patients with a reduced sodium intake (94) and reductions of 1.6 and 1.1 mm Hg, respectively, in overweight and obese patients with each kilogram of weight lost (95). The DASH study also provided convincing evidence that MNT is a viable first step in the ther-
apeutic regimen to lower hypertension. Using a dietary pattern that emphasized vegetables, fruits, and low-fat dairy products, nonhypertensive participants decreased their systolic and dia-
stolic blood pressure by 3.5 and 2.1 mm Hg, respectively, and hypertensive participants decreased their values by 11.4 and 5.5 mm Hg, respectively (92).

If MNT and lifestyle changes alone fail to lower the blood pressure to the goal level, then pharmacotherapy is indicated. However, patients should be encouraged to continue MNT and lifestyle changes because these might result in fewer medicad-
tions and lower dosages being required to achieve optimal blood pressure control (5). Patients on pharmacotherapy should be monitored on a regular basis by a health care team because most of the medications used to treat hypertension have at least one nutrition-related side effect. Thiazide and loop diuretics, which block the resorption of sodium, also cause a concurrent loss of potassium, magnesium, and zinc and, in the case of loop diuretics, calcium (43). Conversely, potassium-
sparing diuretics exchange potassium for sodium, resulting in an increase in serum potassium concentrations and a need to monitor potassium intake to prevent hyperkalemia (43). Com-
pounds in grapefruit magnify the action of calcium channel blockers and should, therefore, be avoided by patients taking these medications (43). Angiotensin-converting enzyme inhib-
itors and α-blockers can cause glucose intolerance (43). The α-blockers can also produce hyperlipidemia (43). If monop-
otherapy fails to result in a desirable blood pressure, combina-
tion therapy is a possibility, resulting in multiple medication/ nutrient interactions. Consequently, a qualified dietetics professional should be a member of the health care team that monitors the patient.
HYPERLIPIDEMIA

According to the American Heart Association, coronary heart disease (CHD) is the most frequent cause of death among adults in the United States, accounting for one of every five deaths. Approximately 62 million Americans are estimated to have cardiovascular disease, and, of these individuals, 650,000 people will have an initial myocardial infarction (MI) and 450,000 will have a recurrent MI each year (96). With an estimated total annual cost of $111.8 million because of CHD alone (approximately 12 million of the 62 million with cardiovascular disease have diagnosed CHD), the economic consequences associated with this disease are stunning (96). Of this total, $58.2 billion is due to direct medical costs, including hospitalization, long-term care, health professional fees, medications, and home health care, and $53.6 billion is due to indirect costs such as lost productivity and premature mortality (96).

The role of diet in the development of hyperlipidemia, the first step in developing cardiovascular disease and, more specifically, CHD, has long been recognized. The Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) recommends MNT as the first line of treatment for most individuals with elevated blood lipids, in particular LDL-C (16). This approach is supported by the Hyperlipidemia Medical Nutrition Protocol, one of the American Dietetic Association MNT Evidence Based Guides for Practice (32). Not only is MNT effective in lowering LDL-C concentrations, it is also cost-effective when compared with initial treatment with pharmacotherapy. When pharmacotherapy is necessary, concurrent MNT can lower the medication dose required, thereby still resulting in cost savings (97-100). Delahanty and colleagues (99) reported that MNT resulted in a 6% decrease in total and LDL-cholesterol concentrations after three months with one-third of the group showing at least a ten percent decrease in total cholesterol concentrations. The overall cost-effectiveness ratio for MNT was $36 for each 1% reduction in total and LDL-cholesterol concentrations. One of the studies by Sikand and colleagues (98) also reported that, after MNT delivered by a registered dietitian, only 50% of the eligible patients required lipid-lowering medications, resulting in an annual cost savings of $27,449, or $638 per patient. Furthermore, in a previous study by Sikand and colleagues (97), over 50% of the subjects treated for high cholesterol by a registered dietitian were no longer eligible for cholesterol lowering medication. This resulted in an annual cost savings of $60,561 or $904 per patient.

However, the NCEP report also recommends concurrent MNT and pharmacotherapy for those patients at high risk for CHD, in particular those individuals with an LDL-C concentration ≥130 mg/dL and who have CHD or one or more CHD risk equivalents (including cigarette smoking, hypertension, family history of premature CHD, age, diabetes, and other clinical forms of atherosclerotic disease) (16). The presence of these CHD risk equivalents, several of which have MNT and pharmacotherapy components of their own, along with MNT and pharmacotherapy for the treatment of the CHD, emphasizes the need for long-term monitoring by a multidisciplinary health care team for safe and effective care. Nicotinic acid can increase serum glucose, hba1c, and uric acid concentrations (43). Several of the HMG-CoA reductase inhibitors (statins), including atorvastatin, lovastatin, and simvastatin, should not be taken with grapefruit (43), which inhibits the oxidative metabolism of these medications by the intestinal cytochrome P450 3A4 isoenzymes. The bile acid sequestrants (resins) can also decrease the absorption of calcium; iron; zinc; magnesium; β-carotene; folate; and vitamins A, D, E, and K (43). Because of these medication-nutrient interactions related to pharmacotherapy for hyperlipidemia, continued follow-up by a dietetics professional is recommended (32).

CONCLUSIONS

MNT and lifestyle changes are vital components in the successful treatment of numerous chronic medical conditions. Although adherence to MNT and lifestyle changes may prevent or delay the necessity of pharmacotherapy, the successful management of some conditions will require concurrent therapy. The increased use of complementary alternative medicine therapies by the public also adds complexity to the management of many of these conditions. Consequently, a thorough evaluation and frequent monitoring by a multidisciplinary health care team, including dietetics professionals, is the most effective means of helping the patient achieve optimal long-term control of their condition.

References

ADA REPORTS


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Recognition is given to the following for their contributions:

Authors:

Mary Hager, PhD, RD (Hope House, Dover, NJ); Andrea Hutchins, PhD, RD (Arizona State University East, Mesa, AZ)

Reviewers:

American Society of Clinical Nutrition, Bethesda, MD: A.S.P.E.N. (Mary Marian, MS, RD, University of Arizona, Tucson, AZ); Judith G. Dausch, PhD, RD (American Dietetic Association) Washington, DC;

Diabetes Care and Education dietetic practice group (Mary M. Austin, RD, MA, The Austin Group, LLC, Shelby Township, MI);

Dietitians in Nutrition Support dietetic practice group (M. Patricia Fuhrman, MS, RD, FADA, Jewish Hospital College, St. Louis, MO; Mary K Russell, MS, RD, Duke University Hospital, Durham, NC);

Dietetic Technicians in Practice dietetic practice group (Deborah L. Redditt, DTR, clinical nutrition, management consultant, Palm City, FL); Stephanie L. England, MS, RD (University of Tennessee at Chattanooga, Chattanooga, TN);

HIV/AIDS dietetic practice group (Jennifer R. Eliasi, MS, RD, Brooklyn Hospital Center, Brooklyn, NY); Janet W. Gloeckner, PhD, RD (James Madison University, Harrisonburg, VA); Paula Davis McCallum, MS, RD (Advantage Nutrition, Ltd, Summerfield, NC); Pam Michael, MBA, RD (American Dietetic Association, Chicago, IL);

Nutrition in Complementary Care dietetic practice group (Geeta Sikand, MA, RD, FADA, nutrition consultant, Mission Viejo, CA); Ellen Pritchett, RD (American Dietetic Association, Chicago, IL); Naveena Reddy, MS, RD (Olathe Medical Center, Olathe, KS)

Association Positions Committee Workgroup:

Evelyn Enrione, PhD, RD (chair), Abby Bloch, PhD, RD, FADA, Martina Cartwright, PhD, RD (content advisor)